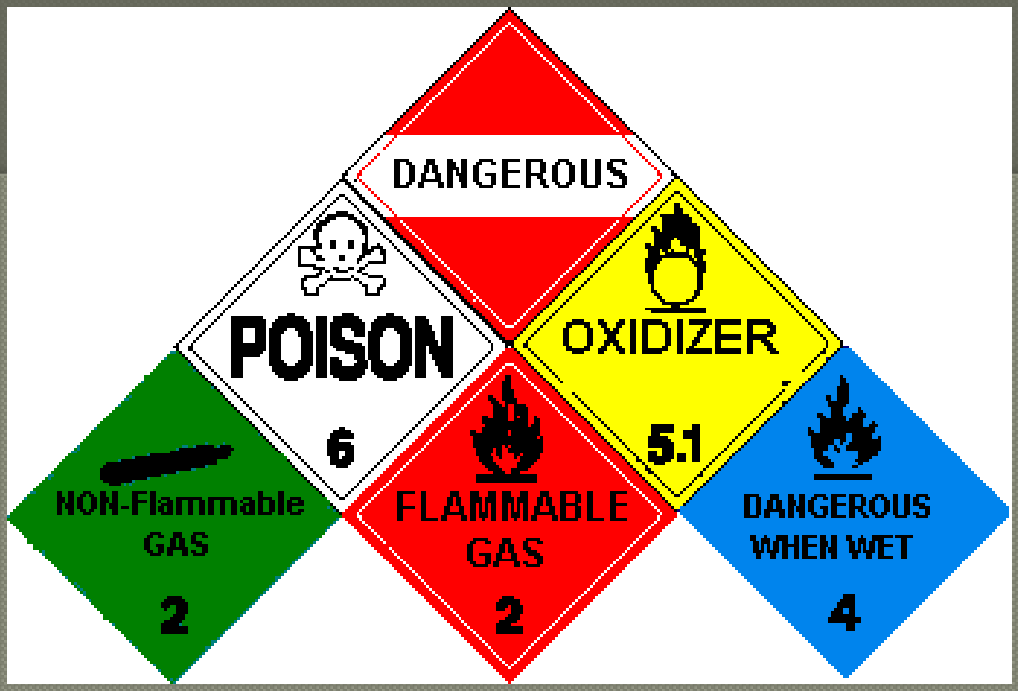
به نام خدا
ایمنی در صنعت ۲



مدرس : مهندس قلعه نوی

نیمسال دوم ۹۳-۹۲

بیان اهداف و کلیات

-شرایط کلاس

- منابع و رفرنس ها

ایمنی در صورت کار تیمی تحقق می یابد

“Nothing is so important that it can not be done safely.”

منابع درس:

- **Safety and health for engineers , chapter 11 to 15**
- ایمنی در صنعت و خدمات دکتر ارقامی . فصل علائم و نشانه های ایمنی
- **Industrial safety and health management chapter 9.11.12.13.14**
- **Niosh pocket guide to chemical safety**
- **Chemical safety , chapter 6**
- **Loss prevention in the process industries vol2.23.8**
- دستورالعملهای وزارت کار در خصوص مواد شیمیایی و مواد خطرناک
- مهندسی حریق .. دکتر رستم گلمحمدی
- ایمنی در صنعت نفت و گار . دکتر علی کریمی
- **http://www.ihmm.org/index.php?option=com_content&view=article&id=61&Itemid=161**
- **http://www.hawaii.edu/ehso/hazmat/**

شرایط کلاس و نحوه ارزشیابی

- حضور در کلاس دارای اهمیت بسیاری است. از غیبت غیرموجه بپرهیزید
- استفاده از موبایل و هر گونه وسیله ارتباطی که باعث حواسپرتی گردد مجاز نیست.
- هر جا سوالی پیش میاید بپرسید.
- رفت و آمدهای بیمورد در حین کلاس باعث پشیمانی است.
- کوییز ، آزمون میان ترم و کار کلاسی و عملی جزیی از نمره پایان ترم شما است پس در انجام هر چه بهتر آنها بکوشید.

نحوه ارزشیابی

- برای کلیه فعالیتهای کلاسی شما در طول ترم نمره ای در نظر گرفته میشود پس زیاد به خواندن در شب امتحان و قبولی نیاندیشید.
- کوییز همانطور که از نامش پیداست آزمونی است کوتاه و در هر زمانی قابل اجرا ، بنابراین از قبل برای گرفتن کوییز هشداری داده نمیشود.
- آزمون میان ترم در هفته هشتم برگزار میشود.
- کار کلاسی شما بصورت فردی یا حداکثر دو نفری است که موضوع آن در اسلاید بعدی قابل مشاهده است.
- حضور فعال شما در کلاس درس مزید امتنان است.

راههای تماس با من

- از طریق ایمیل : m.ghalenoy@gmail.com لطفا در بخش موضوع ایمیل کلمه student را بنویسید.
- بصورت حضوری در اتاقم روزهای دوشنبه ۸-۱۰ و ۱۲-۱۴ و روزهای چهارشنبه ۸-۱۱
- در کلاس مجازی از طریق سایت

http://elearning.qums.ac.ir

موضوعی تحت نام همین درس در این سایت ایجاد شده که میتوانید مشکلات و سوالات خود را بپرسید و در مباحث شرکت نمایید.

سرفصل درسی مصوب

هدف کلی درس : آشنایی دانشجویان با ایمنی مواد شیمیایی و فرآیندهای مربوطه ، فراگیری جنبه های نظری و عملی حریق و کنترل آن

. رئوس مطالب : (۳۴ساعت نظری- ۳۴ ساعت عملی)

الف) نظری:

- تعریف کدهای شناسایی مواد
- خطرات مواد شیمیایی
- طبقه بندیهای مواد شیمیایی
- ارتباطات ایمنی مواد شیمیایی
- آشنایی با اوراق اطلاعاتی ایمنی شناسی (MSDS)
- برچسب های ایمنی شناسی ، پلاکاردها ، پوسترهای مربوطه
- نگهداری مواد شیمیایی (ظروف ، قفسه های ایمنی و انبارداری و ...)
- جابجایی و انتقال مواد شیمیایی و حمل و نقل آنها
- ایمنی در سفارش و خرید مواد شیمیایی
- تجهیزات حفاظت فردی در کار با مواد شیمیایی شامل وسایل حفاظت سر ، صورت ، بدن ، سیستم تنفس و ...)
- آشنایی با وسایل نگهداری وسایل ایمنی فردی
- اصول احتراق
- عوامل ایجاد کننده حریق
- ارائه مفاهیم اولیه مربوط به چهاروجهی حریق وجزئیات هر وجه آن
- شناسایی انواع مواد قابل سوختن
- اصول ایمنی در پیشگیری حریق

فهرست مطالب

- مقدمه
- مبادله اطلاعات خطر
- مواد خطرناک

INTRODUCTION
Key Points

- Hazardous materials are potentially dangerous if not handled properly
- Know what you are handling
- Know the hazards associated with the material
- Know the measures you can take to protect yourself and others

INTRODUCTION
Regulatory Requirements

- OSHA - employee safety - hazard communication - 29 CFR 1910.1200
- EPA - environmental safety
- DOT - transportation safety - shipping & receiving requirements - 49 CFR

HAZARD COMMUNICATION

- The purpose of this standard is to communicate information about hazardous chemicals to employees so they can work safely
- A hazardous chemical means any chemical which is a physical hazard (flammable, reactive, explosive, etc.) or a health hazard (exposure results in acute or chronic health effects
- Training must be provided upon initial employment and when new hazards are introduced into the workplace

HAZARD COMMUNICATION
Effects of Exposure

- ACUTE - direct threat that shows up almost immediately after exposure such as burns from contact with a corrosive chemical
- CHRONIC - usually result from repeated exposure that occurs over months or years and includes cancer and some allergic reactions

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Hazard Communication

Your "Right to Know"

Five Stages of the Program

- Material Safety Data Sheets (MSDSs)
- Labeling and Marking Systems
- Employee Training
- Written Plan
- Chemical Inventory List (CIL)

Oklahoma State University

Hazard Communication

Material Safety Data Sheets

Hazard Communication

Material Safety Data Sheets

- Company Information
- Hazardous Ingredients
- Physical Data
- Fire and Explosion Data
- Health Hazard Data
- Reactivity Data
- Spill & Leak Procedures
- Special Protection Information
- Special Precautions

Material Safety Data Sheets: Your Rights

1. Your employer must have an MSDS for every hazardous substance you use as part of your job.

Material Safety Data Sheets: Your Rights

2. These MSDSs must be available to you the entire time you are in the workplace.

Material Safety Data Sheets: Your Rights

3. If you request to see a copy of an MSDS for a product you use, and your employer cannot provide it after one working day, you may refuse to use that product or work in an area where it is being used.

Material Safety Data Sheets: Your Rights

4. If you request your own personal copy of an MSDS, your employer has 15 days to provide it.

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Hazard Communication

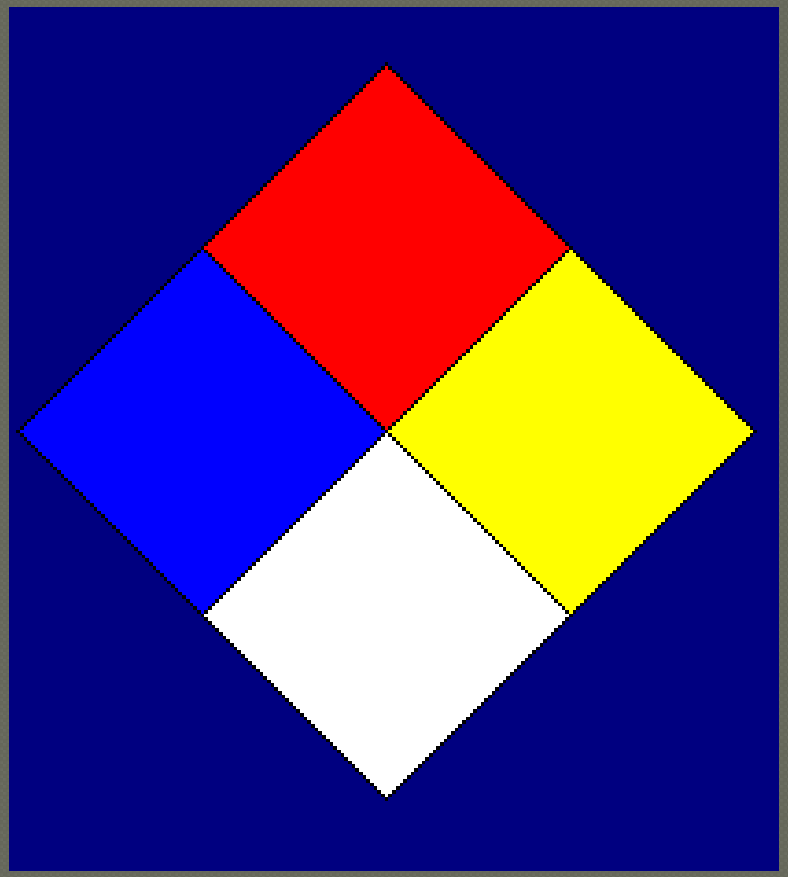
Labeling and Marking Systems

Labeling and Marking Systems

- NFPA Diamonds
- HMIS Labels
- Uniform Laboratory Hazard Signage System

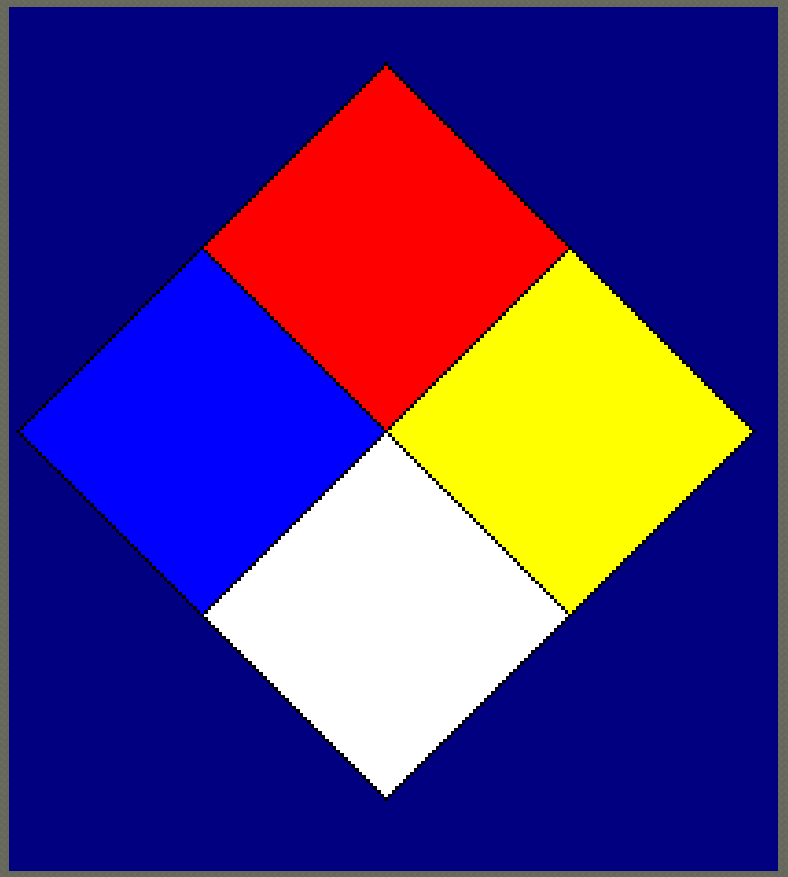
Labeling and Marking Systems
NFPA Diamonds

- Color coded, numerical rating system
- Will be located near main entrances, fire alarm panels, or on outside entrance doors
- Provide at-a-glance hazard information



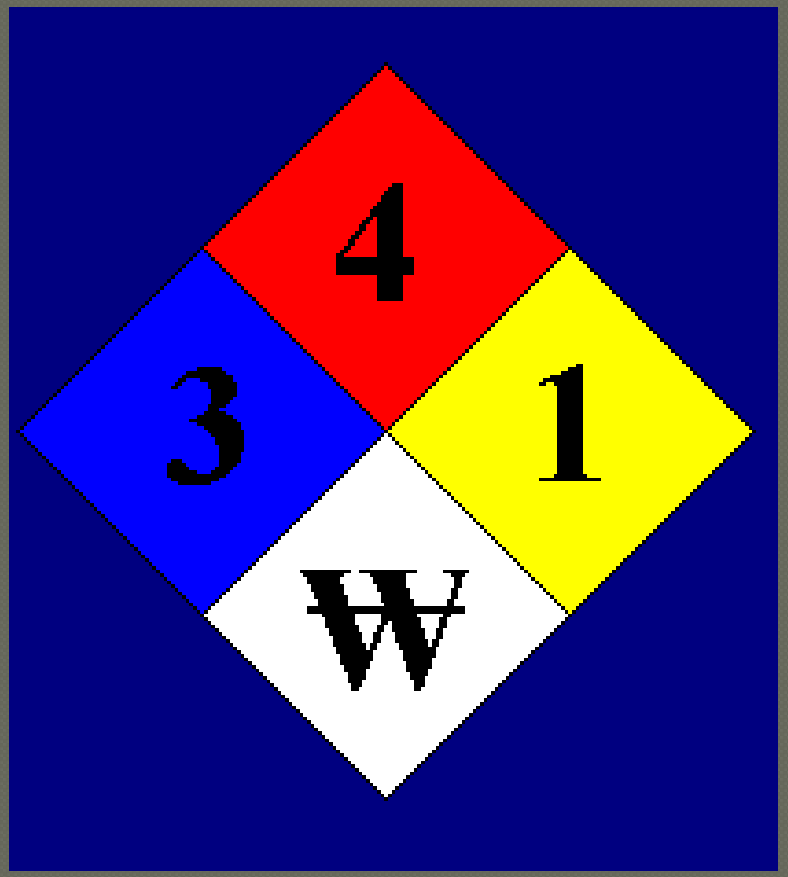
Labeling and Marking Systems
NFPA Diamonds

- **Blue = Health**
- Red = Flammability
- Yellow = Instability
- White = Special hazard information



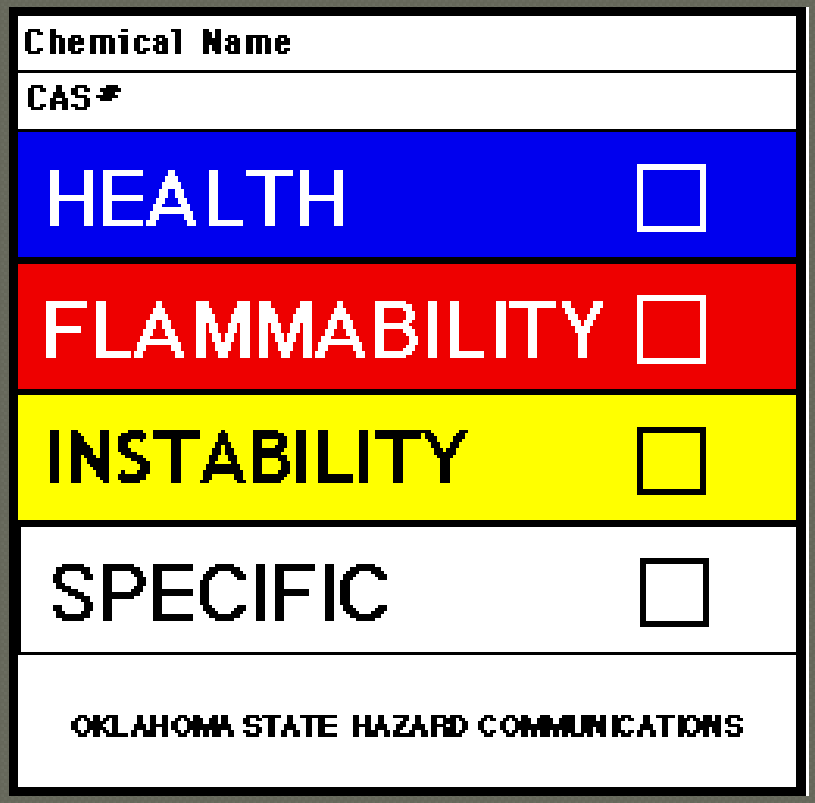
Labeling and Marking Systems
NFPA Diamonds

- 4= Deadly Hazard
- 3= Severe Hazard
- 2= Moderate Hazard
- 1= Slight Hazard
- 0= No Hazard



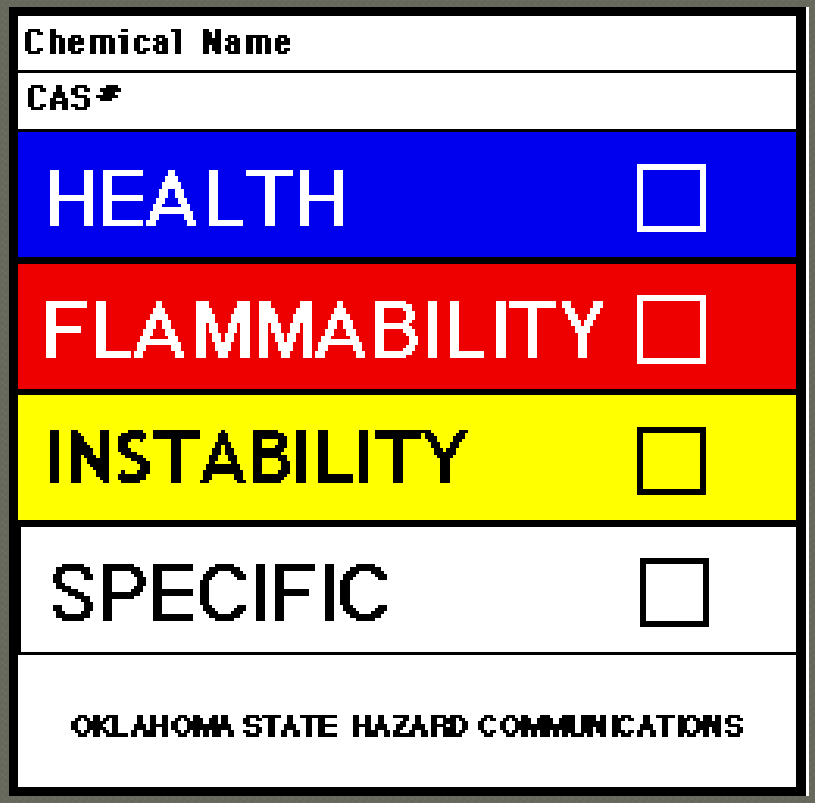
Labeling and Marking Systems
HMIS Labels

- Designed to go on individual containers of products that don't have the manufacturer's labels
- Same color code/numerical rating system as the NFPA diamonds



Labeling and Marking Systems
HMIS Labels

- **Blue = Health**
- Red = Flammability
- Yellow = Instability
- White = Personal Protective Equipment or special protection information
- Numerical Rating of 0-4



Labeling and Marking Systems
HMIS Labels

- You should never have any unattended, unlabeled containers in your workplace!

Labeling and Marking Systems
Uniform Laboratory Signage

- Located on laboratory and chemical storage area doors
- Pictographs depict worst hazards present in lab or area

Labeling and Marking Systems Uniform Laboratory Signage

- Always check with the appropriate personnel (lab manager, chemical hygiene officer, etc.) before performing work or maintenance in a laboratory!

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Hazard Communication

Employee Training

Hazard Communication Employee Training

- Training is required:
  - Within the first 30 days of employment
  - Whenever new hazards are introduced
  - Annually

Hazard Communication Employee Training

- The training must cover:
  - Requirements of regulations
  - Location and availability of MSDSs
  - Hazardous chemicals used in the workplace
  - Method to detect release
  - Physical and health hazards
  - Measures for personal protection
  - Details and location of the written plan

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Hazard Communication

The Written Plan

Hazard Communication
The Written Plan

You have a right to possess your own copy of OSU's written hazard communications plan, which is OSU Policy #3-0535.

Hazard Communication
The Written Plan

It is available from EHS (ext. 47241)
or online at:
http://www.ehs.okstate.edu/index.htm

Hazard Communication
The Written Plan

If you are exposed to a hazardous substance at work, you should report it to your supervisor who will complete an "Employee Exposure Report Form"

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Hazard Communication

Chemical Inventory List

Hazard Communication Chemical Inventory List

Federal law requires an inventory of all chemicals on the OSU campus, and that it be updated annually.

Hazard Communication Chemical Inventory List

This list is used to determine correct signage for rooms and buildings, and is made available to the fire department for their use during emergencies.

Hazard Communication Chemical Inventory List

The CIL must have the following information:

Hazard Communication Chemical Inventory List

Department Name and Phone Number
Inventory Supervisor
Campus mailing address of the Inventory Supervisor
Official Building Name & number
Date of Inventory
Page ( ) of ( )
Chemical Name
Common Name
Location (room number) of the chemical
Actual count of a chemical
Maximum amount anticipated
Container type and size
Physical State and CAS Number
Manufacturer, NFPA Rating
Does the department have an MSDS for it?

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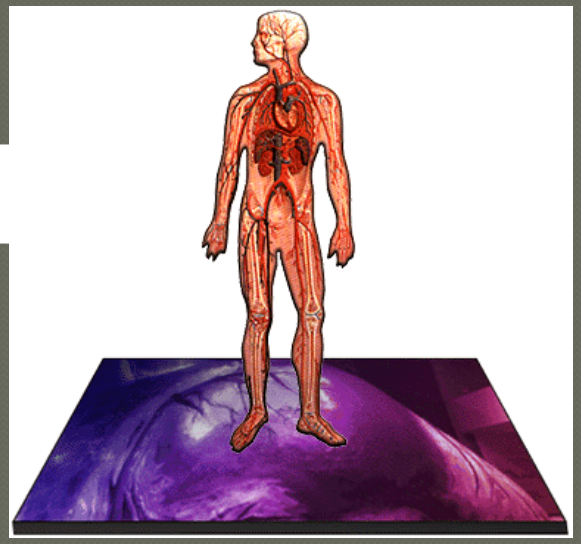
Hazard Communication

BE SAFE,
NOT SORRY!

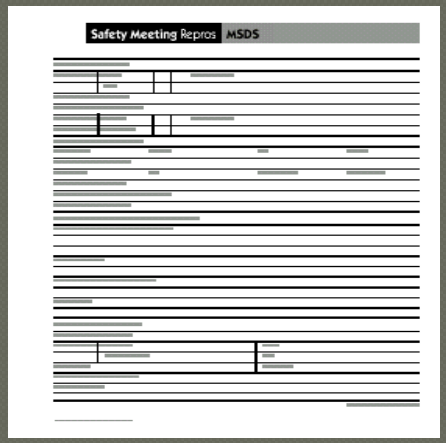
HAZARD COMMUNICATION
Routes of Exposure

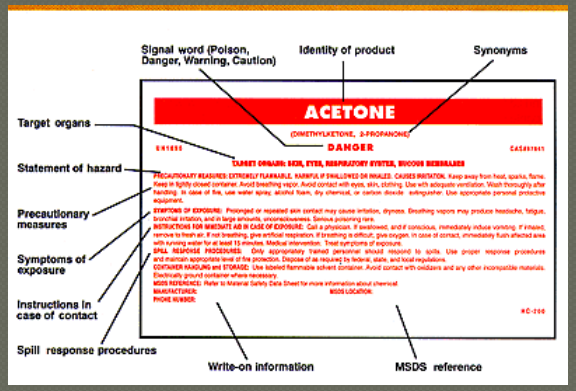
- INHALATION
- ABSORPTION
- INGESTION
- INJECTION



HAZARD COMMUNICATION
Hazard Identification

- MSDS's
- LABELS





HAZARD COMMUNICATION MSDS's

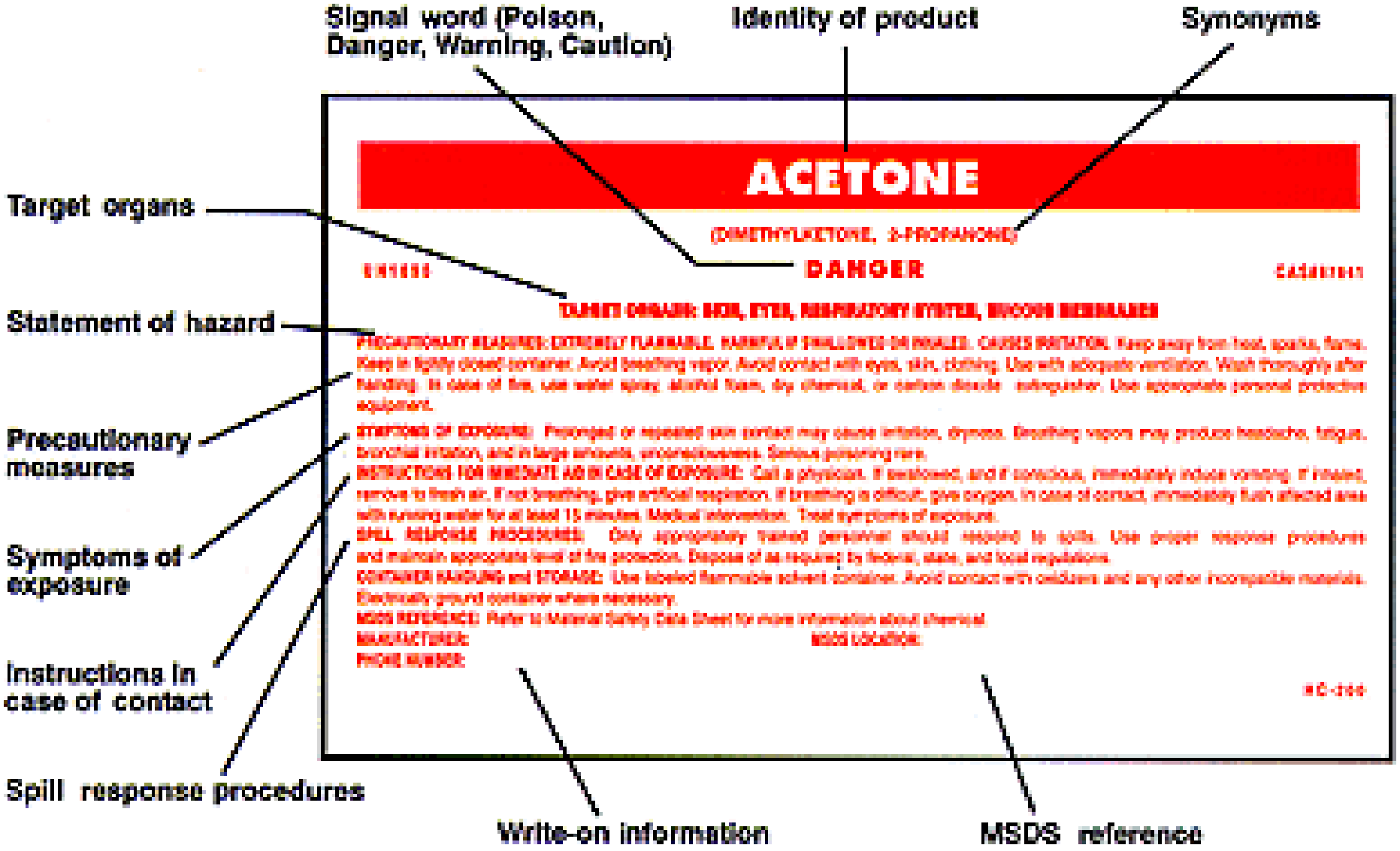
- Chemical information sheets that include chemical ID, physical characteristics, hazardous ingredients, health hazards, handling precautions, first aid, reactivity data and control procedures
- Must have a sheet for every hazardous chemical on site and must be accessible to every employee

HAZARD COMMUNICATION LABELS

- All containers must be properly labeled
- Labels on original containers must include the identity of the material, appropriate hazard warnings and manufacturer information
- Labels on secondary containers must include identity and appropriate hazard warning

HAZARD COMMUNICATION LABELS

- Appropriate hazard warnings include DOT hazard classes, NFPA Hazard Diamond, or a descriptive statement of the hazards
- Whichever method is employed, it must be used consistently throughout the labs and all workers must be familiar with the method

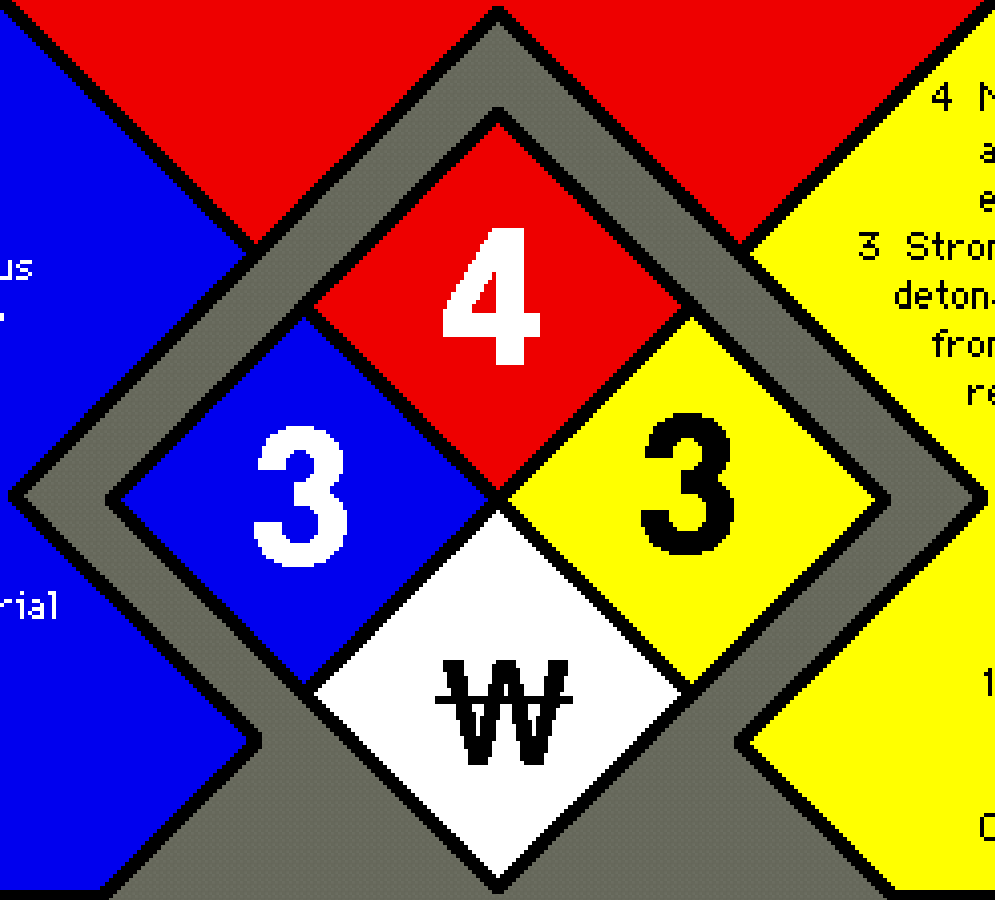

Signal word (Poison, Danger, Warning, Caution)
Identity of product
Synonyms
ACETONE
(DIMETHYLKETONE, 2-PROPANONE)
DANGER
Target organs
Statement of hazard
Precautionary measures
Symptoms of exposure
Instructions in case of contact
Spill response procedures
Write-on information
MSDS reference

FLAMMABLE

4 Extremely flamable
3 Ignites at normal temperatures
2 Ignites when moderately heated
1 Must be preheated to burn
0 Will not burn

HEALTH

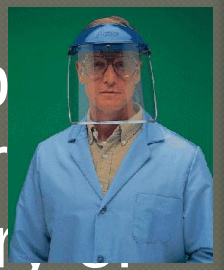
4 Too dangerous to enter vapor or Liquid
3 Extremely dangerous use full proctective clothing
2 Hazardous - Use breathing apparatus
1 Slightly hazardous
0 Like ordinary material



REACTIVITY

4 May detonate - Vacate area if materials are exposed to fire
3 Strong shock or heat may detonate - Use monitors from behind explosive resistant barriers
2 Violent chemical change possible - Use hose streams from distance
1 Unstable if heated - Use normal precautions
0 Normally stable

HAZARD COMMUNICATION
Personal Protective Equipment



- Personal Protective Equipment (PPE) must b provided when necessary by reason of hazar encountered that are capable of causing injur impairment
- PPE is not a substitute for engineering, work practice, and/or administrative controls
- Use of PPE does not eliminate the hazard so if the equipment fails then exposure occurs
- Must be worn to provide protection

HAZARD COMMUNICATION
Chemical Storage

- Containers should be inspected periodically and at least annually to assure container and label integrity
- Secondary containment can prevent serious spills and subsequent reactions
- All hazardous materials must be stored according to compatibility so that accidental mixing does not occur (applies to gas cylinders as well)

HAZARDOUS MATERIALS
Shipping & Receiving Requirements

- All hazardous materials must be prepared in accordance with the appropriate federal Hazardous Materials Regulations found in 49 CFR

HAZARDOUS MATERIALS
Shipping & Receiving Requirements

- A “hazardous material” is a substance or material that has been determined to be capable of posing an unreasonable risk to health, safety and property when transported in commerce
- A “hazmat employee” is anyone who directly affects hazardous materials transportation safety

HAZARDOUS MATERIALS
Shipping & Receiving Requirements

- Hazardous material must be properly classed, described, packaged, marked, labeled, and in condition for shipment
- Ensure that the material offered for shipment is neither “forbidden” nor “prohibited” from transportation
- Know exactly what you are shipping and receiving - If in doubt STOP

HAZARDOUS MATERIALS Training Requirements

- All hazmat employees must receive initial training and periodically retrained at least every 3 years
- Initial training must be within 90 days of employment
- Employees must be tested and training certification must be documented

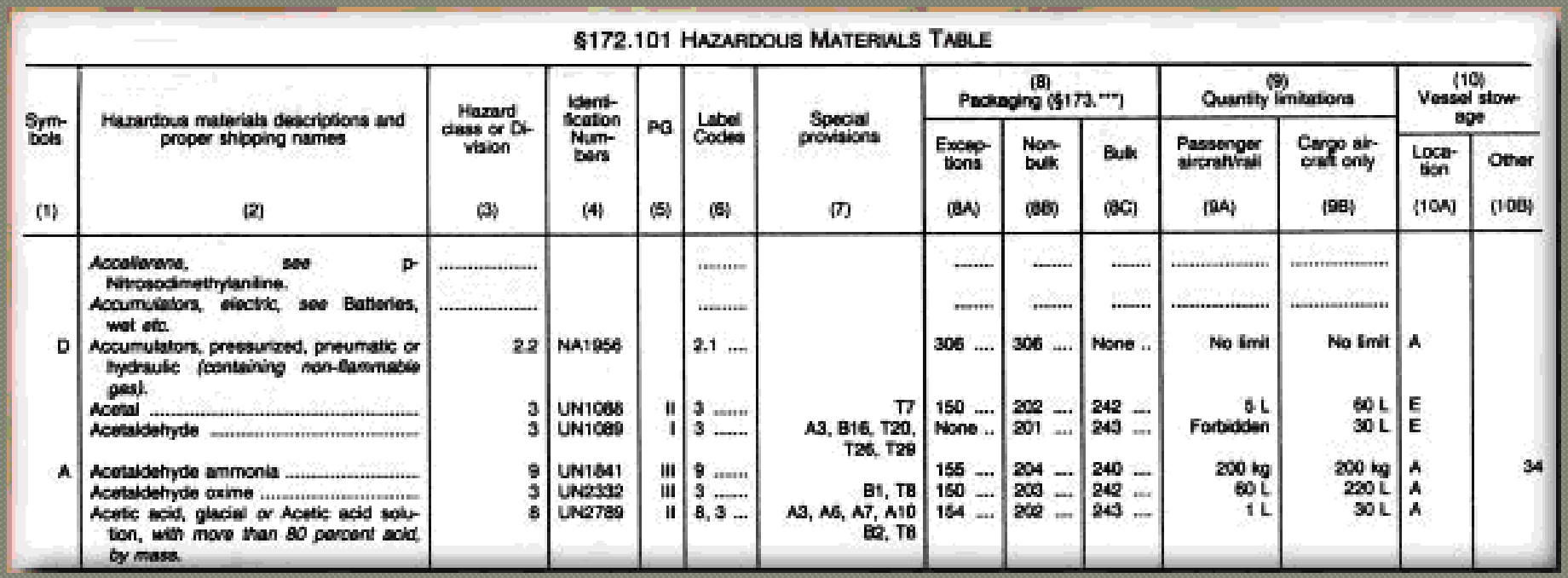
CLASSIFICATION AND DESCRIPTION OF MATERIALS

- Application of applicable regulations begins with classification of the material
- Hazardous Materials are grouped into 9 primary hazard classes
- Some of these hazard classes have subdivisions
- Properly describing a hazardous material not only communicates the presence of a hazardous material, but also establishes the specific emergency actions to take in an emergency

DESCRIPTION OF MATERIALS
The Hazardous Materials Table

- Describes the requirements that applies to each shipment of a hazardous material
- The description includes:
  - -proper shipping name
  - -hazard class or division number
  - -identification number

Material Classification
The Hazardous Materials Table



§172.101 HAZARDOUS MATERIALS TABLE

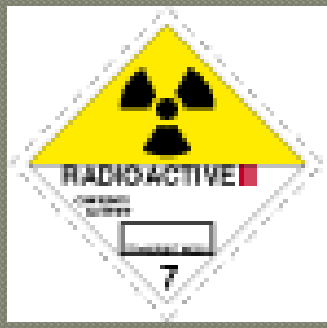
Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or Division	Identification Numbers	PG	Label Codes	Special provisions	(8) Packaging (§173.***) Exceptions	Non-bulk	Bulk	(9) Quantity limitations Passenger aircraft/rail	Cargo aircraft only	(10) Vessel stowage Location	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
	Accelerene, see p-Nitrosodimethylaniline.	.....			.....		.....	.....	.....	.....	.....		
	Accumulators, electric, see Batteries, wet *etc.*	.....			.....		.....	.....	.....	.....	.....		
D	Accumulators, pressurized, pneumatic or hydraulic *(containing non-flammable gas).*	2.2	NA1956		2.1		306	306	None ..	No limit	No limit	A	
	Acetal	3	UN1088	II	3	T7	150	202	242	5 L	60 L	E	
	Acetaldehyde	3	UN1089	I	3	A3, B16, T20, T26, T29	None ..	201	243	Forbidden	30 L	E	
A	Acetaldehyde ammonia	9	UN1841	III	9		155	204	240	200 kg	200 kg	A	34
	Acetaldehyde oxime	3	UN2332	III	3	B1, T8	150	203	242	60 L	220 L	A	
	Acetic acid, glacial *or* Acetic acid solution, *with more than 80 percent acid, by mass.*	8	UN2789	II	8, 3 ...	A3, A6, A7, A10 B2, T8	154	202	243	1 L	30 L	A	

The shipping description must appear on the Shipping Paper in the exact proper sequence as shown in the Hazardous Materials Table

Material Classification

HAZARD CLASSES

Class 1: Explosives
Class 2: Gases
Class 3: Flammable Liquids
Class 4: Flammable Solids
Class 5: Oxidizing Substances
Class 6: Poisons
Class 7: Radioactive Materials
Class 8: Corrosive Materials
Class 9: Miscellaneous Hazardous Materials



Material Classification
Class 1 - Explosive Hazards

- Explosions are very fast chemical reactions which release large quantities of gas.
- Explosives include:
  - sporting ammunition
  - blasting charges and detonators
  - fireworks

Material Classification
Class 2 - Compressed Gases

- A compressed gas has a physical hazard due to the increased pressure under which the chemical is maintained.
- Compressed gases include:
  - oxygen
  - nitrogen
  - compressed air
  - acetylene

Material Classification
Class 3 - Flammable Liquids

- Flammable liquids, as the name implies, are liquids which burn.
- Flammable liquids include:
  - gasoline
  - alcohols
  - solvents such as benzene

Class IA flammable liquid	Fl.P. below 73 °F and BP below 100 °F.
Class IB flammable liquid	Fl.P. below 73 °F and BP at or above 100 °F.
Class IC flammable liquid	Fl.P. at or above 73 °F and below 100 °F.
Class II combustible liquid	Fl.P. at or above 100 °F and below 140 °F.
Class IIIA combustible liquid	Fl.P. at or above 140 °F and below 200 °F.
Class IIIB combustible liquid	Fl.P. at or above 200 °F.
BP	Boiling point at 1 atmosphere, °F
Fl.P	Flash point (i.e., the temperature at which the liquid phase gives off enough vapor to flash when exposed to an external ignition source), closed cup (unless annotated "(oc)" for open cup), °F

Material Classification
Class 4 - Other Flammable Hazards

- Other flammable hazards include:
  - flammable solids
  - self-reactive substances
  - substances which, in contact with water, emit flammable gases

Material Classification
Class 5 - Oxidizers/Organic Peroxides

- These are chemicals which will accelerate combustion.
- Examples include:
  - sodium chlorate
  - hydrogen peroxide
  - methyl ethyl ketone

Material Classification
Class 6 - Toxic & Infectious Agents

- Health hazards include those products and materials which have an adverse effect on humans and animals.

Examples

pes

tissue/blood sa

Material Classification
Class 7 - Radioactive Materials

Material Classification Class 8 - Corrosives

- Corrosive materials will react chemically with steel, aluminum or skin.
- Examples include:
  - acids such as hydrochloric
  - alkaline materials such as sodium hydroxide
  - gases such as chlorine and ammonia

Material Classification
Class 9 - Miscellaneous Hazards

- Don’t readily fall into the other categories.
- Examples include:
  - substances with nc
  - substances which ar